1. A method of welding age-hardenable aluminum alloy to improve strength properties in a heat affected zone and a weld zone, the method comprising the steps of:

(a) providing precipitation hardenable aluminum alloy members to be welded;

(b) subjecting said members to a first aging step for times and temperatures to generate strengthening precipitates to provide aged members;

(c) welding said aged members to provide a welded assembly having a weld zone; and

(d) subjecting said welded assembly to a second aging step to reprecipitate strengthening precipitates dissolved in the weld zone during the welding step.

2. The method in accordance with claim 1 wherein said first aging step includes aging at a temperature in the range of 100° to 300°F for 0.25 to 24 hours.

3. The method in accordance with claim 1 wherein said first aging step includes aging at a temperature in the range of 200° to 300°F for 0.25 to 24 hours.

4. The method in accordance with claim 1 wherein said second aging step includes aging at a temperature in the range of 100° to 300°F for a time of 0.25 to 24 hours.

5. The method in accordance with claim 1 wherein said second aging step includes aging at a temperature in the range of 230° to 270°F for a time of 0.25 to 24 hours.

6. The method in accordance with claim 1 wherein said second aging step ages said weld assembly to a T6 temper.

7. The method in accordance with claim 1 wherein said second aging step ages said weld assembly to a T5 temper.

8. The method in accordance with claim 1 wherein said second aging step ages said weld assembly to a T8 temper.

9. The method in accordance with claim 1 wherein said second aging step ages said weld assembly to a T76 temper.

10. The method in accordance with claim 1 wherein said second aging step ages said weld assembly to a T73 temper.

11. The method in accordance with claim 1 wherein said second aging step ages said weld assembly to a T74 temper.

12. The method in accordance with claim 1 wherein said second aging step includes aging said weld assembly to a T77 temper.

13. The method in accordance with claim 1 including subjecting said welded assembly to a third aging step to improve corrosion properties of said welded member.

14. The method in accordance with claim 5 including subjecting said welded assembly to three post-weld aging treatments wherein said second post weld aging treatment includes aging said welded assembly in a temperature range of 300° to 500°F for 0.25 to 24 hours and wherein said third treatment includes aging said welded assembly in the range of 175° to 325°F for 2 to 30 hours.

15. The method in accordance with claim 14 wherein said third treatment includes aging in the range of 200° to 300°F.

16. The method in accordance with claim 1 wherein said aluminum alloy is AA7xxx alloys.

17. The method in accordance with claim 1 wherein said aluminum alloy is AA2xxx alloys.

18. The method in accordance with claim 1 wherein said aluminum alloy is AA6xxx alloys.

19. The method in accordance with claim 1 wherein said aluminum alloy is an alloy selected from the group consisting of AA7075, AA7050, AA7150, AA7055, AA7068, AA7249, AA7349 and AA7449.

20. The method in accordance with claim 1 wherein said aluminum alloy is an alloy selected from the group consisting of AA6061, AA6013, AA6056 and AA6082.

21. The method in accordance with claim 1 wherein said aluminum alloy is an alloy selected from the group consisting of AA2024, AA2014, AA2026, AA2224, AA2097, AA2297, AA2397, AA2293, AA2219, AA2094, AA2098 and AA2095.

22. A method of welding an age-hardenable aluminum alloy to improve properties in the heat affected zone and weld zone, the method comprising the steps of:

(a) providing AA7xxx precipitation hardenable aluminum alloy members to be welded;

(b) subjecting said members to a first aging step to provide aged members;

(c) welding said aged members to provide a welded assembly having a heat affected zone and a weld zone; and

(d) after welding, subjecting said welded assembly to a post welding aging treatment or treatments to provide said welded assembly in a temper selected from the group consisting of T6, T73, T74, T76 and T77 tempers.

23. The method in accordance with claim 22 wherein said T6 temper includes an aging treatment in a temperature range of 100° to 300°F for 0.25 to 24 hours.

24. The method in accordance with claim 22 wherein said T73 temper includes an aging treatment in a temperature range of 200° to 300°F for 0.25 to 24 hours followed by a second aging step carried out at temperatures between 325°F and 360°F for times ranging from a few seconds or minutes to 6 or more hours.

25. The method in accordance with claim 22 wherein said T74 temper includes an aging treatment in a temperature range of 200° to 300°F for 0.25 to 24 hours followed by a second aging step carried out at temperatures between 335°F and 360°F for times ranging from a few minutes to 6 or more hours

26. The method in accordance with claim 22 wherein said T76 temper includes an aging treatment in a temperature range of 200° to 300°F for 0.25 to 24 hours followed by a second aging step carried out at temperatures between 300°F and 340°F for times ranging from a few seconds or minutes to 6 or more hours.

27. The method in accordance with claim 22 wherein said T77 temper includes:

(a) aging said welded assembly in a temperature range of 100° to 300°F for 0.25 to 24 hours, followed by

(b) subjecting said welded assembly in a temperature range of 300° to 500°F for 0.25 to 24 hours followed by

(c) treating said welded assembly in a temperature range of 200° to 300°F for 0.25 to 24 hours.

28. The method in accordance with claim 22 wherein said aluminum alloy is an alloy selected from the group consisting of AA7075, AA7050, AA7150, AA7055, AA7068, AA7249, AA7349 and AA7449.

29. A method of welding an age-hardenable aluminum alloy to improve properties in the heat affected zone and a weld zone, the method comprising the steps of:

(a) providing AA2xxx precipitation hardenable aluminum alloy members to be welded;

(b) subjecting said members to a first aging step for times and temperatures to provide aged members;

(c) welding said aged members to provide a welded assembly having a heat affected zone and a weld zone; and

(d) after welding, subjecting said welded assembly to post welding aging treatment to provide said welded assembly in a temper selected from the group consisting of T6 and T8 tempers.

30. A method of welding age-hardenable aluminum alloy to improve strength properties in a heat affected zone and a weld zone, the method comprising the steps of:

(a) providing precipitation hardenable aluminum alloy members to be welded, the alloy members fabricated from an alloy selected from the group consisting of AA7075, AA7050, AA7150, AA7055, AA7068, AA7249, AA7349 and AA7449;

(b) subjecting said members to an aging step in a temperature range of 175° to 300°F for one or more hours;

(c) welding said aged members to provide a welded assembly having a weld zone; and

(d) subjecting said welded assembly to a temperature range of 200° to 300°F for 0.25 to 24 hours, then

(e) treating said welded assembly in a temperature range of 300° to 500°F for 0.25 or more hours, and then

(f) exposing said welded assembly to a temperature range of 175° to 325°F for one or more hours.

31. The method in accordance with claim 29 wherein the post welded aging treatment includes exposing the welded assembly to a temperature in the range of 300° to 380°F for 5 to 20 hours.

32. A method of welding age-hardenable aluminum alloy to improve strength properties in a heat affected zone and a weld zone, the method comprising the steps of:

(a) providing precipitation hardenable aluminum alloy members to be welded, the allow members fabricated from an alloy selected from an AA 2xxx series aluminum alloy;

(b) subjecting said members to an aging step in a temperature range of 320° to 380°F for one or more hours;

(c) welding said aged members to provide a welded assembly having a weld zone; and

(d) subjecting said welded assembly to an aging step in a temperature range of 320° to 380°F for one or more hours.

33. A method of welding age-hardenable aluminum alloy to improve strength properties in a heat affected zone and a weld zone, the method comprising the steps of:

(a) providing precipitation hardenable aluminum alloy members to be welded, the allow members fabricated from an alloy selected from an AA 6xxx series aluminum alloy

(b) subjecting said members to an aging step in a temperature range of 320° to 400°F for one or more hours;

(c) welding said aged members to provide a welded assembly having a weld zone; and

(d) subjecting said members to an aging step in a temperature range of 320° to 400°F for one or more hours.

34. The method in accordance with claim 33 wherein one of said members is a plate member.

35. The method in accordance with claim 33 wherein one of said members is an extrusion member.

36. The method in accordance with claim 33 wherein said welded assembly is an aerospace assembly.

37. A method of welding age-hardenable aluminum alloy aircraft structural members to improve strength properties in a heat affected zone and a weld zone, the method comprising the steps of:

(a) providing precipitation hardenable AA7xxx aluminum alloy members to be welded;

(b) subjecting said members to one or more temperatures in a temperature range of 100° to 300°F for one or more hours to generate strengthening precipitates;

(c) welding said aged members to provide a welded aircraft assembly;

(d) heating said assembly to one or more temperatures in the range of 175° to 315°F for one or more hours to reprecipitate strengthening precipitates dissolved in the weld zone, then

(e) heating said assembly to one or more temperatures in the range of 300° to 400°F for one or more hours; and

(f) heating said assembly to one or more temperatures in the range of 175° to 325°F for one or more hours.

38. The method in accordance with claim 37 wherein said aircraft assembly comprises a wing assembly or wing subassembly, center wing box assembly or subassembly, floor assembly or subassembly, including seat tracks, floor beams, stanchions, cargo deck assemblies and subassemblies, floor panels, cargo floor panels, fuselage assembly or subassembly, fuselage frames, fuselage stringers.

39. The method in accordance with claim 37 wherein the AA7xxx include alloys selected from the group consisting of AA7075, AA7050, AA7150, AA7250, AA7055, AA7068, AA7249, AA7349 and AA7449.

40. The method in accordance with claim 37 wherein in step (d) heating is in the range of 175° to about 300°F, in step (e) heating is in the range of 300° to 380°F, and in step (f) heating in the range of 175° to 300°F.

41. In an airplane, an assembly comprised of welded age-hardenable aluminum alloy members, the assembly having improved strength properties in a weld zone or heat affected zone, the alloy members artificially aged prior to welding to generate strengthening precipitates therein and the assembly artificially aged after welding to reprecipitate precipitates dissolved in the weld zone.

42. The assembly in accordance with claim 41 wherein said aging prior to welding includes heating the members to one or more temperatures in the range of 100° to 300°F for one or more hours.

43. The assembly in accordance with claim 41 wherein said aging after welding includes heating said assembly to one or more temperatures in the range of 100° to 300°F for one or more hours.

44. The assembly in accordance with claim 41 wherein said aging after welding includes heating said assembly to one or more temperatures in the range of 230° to 270°F for one or more hours.

45. The assembly in accordance with claim 41 wherein said aging after welding includes heating said assembly to one or more temperatures in the range of 100° to 300°F for one or more hours followed by heating to one or more temperatures in the range of 300° to 500°F for one or more hours.

46. The assembly in accordance with claim 41 wherein said aging after welding includes heating said assembly to one or more temperatures in the range of 100° to 300°F for one or more hours followed by heating to one or more temperatures in the range of 300° to 500°F for one or more hours followed by heating to one or more temperatures in the range of about 175° to about 300°F for one or more hours.

47. The assembly in accordance with claim 41 wherein the alloy members are comprised of an alloy selected from the group consisting of AA7075, AA7050, AA7150, AA7250, AA7055, AA7068, AA7249, AA7349 and AA7449.

48. A structural assembly comprised of welded age-hardenable aluminum alloy members, the assembly having improved strength properties in a weld zone or a heat affected zone, the alloy members artificially aged at one or more temperatures in the range of 100° to 300°F for one or more hours prior to welding, and the assembly artificially aged after welding to reprecipitate precipitate dissolved in the weld zone.

49. The assembly in accordance with claim 48 wherein said aging after welding includes heating said assembly to one or more temperatures in the range of 100° to 300°F for one or more hours.

50. The assembly in accordance with claim 48 wherein said aging after welding includes heating said assembly to one or more temperatures in the range of 100° to 300°F for one or more hours followed by heating to one or more temperatures in the range of 300° to 500°F for one or more hours.

51. The assembly in accordance with claim 48 wherein said aging after welding includes heating said assembly to one or more temperatures in the range of 100° to 300°F for one or more hours followed by heating to one or more temperatures in the range of 300° to 500°F for one or more hours followed by heating to one or more temperatures in the range of about 175° to about 300°F for one or more hours.

52. The assembly in accordance with claim 48 wherein the alloy members are comprised of an alloy selected from the group consisting of AA7075, AA7050, AA7150, AA7055, AA7068, AA7249, AA7349 and AA7449.

53. A method of welding age-hardenable aluminum alloy aircraft structural members to improve strength properties in a heat affected zone and a weld zone, the method comprising the steps of:

(a) providing precipitation hardenable AA2xxx aluminum alloy members to be welded;

(b) subjecting said members to one or more temperatures in a temperature range of 320° to 380°F for one or more hours to generate strengthening precipitates;

(c) welding said aged members to provide a welded aircraft assembly;

(d) heating said assembly to one or more temperatures in the range of 320° to 380°F for one or more hours to reprecipitate strengthening precipitates dissolved in the weld zone.

54. The method in accordance with claim 53 wherein said aircraft assembly comprises a wing assembly or wing subassembly, center wing box assembly or subassembly, floor assembly or subassembly including seat tracks and floor beams, stanchions, cargo deck assemblies and subassemblies, floor panels and cargo floor panels, fuselage assembly or subassembly, fuselage frames, fuselage stringers.

55. The method in accordance with claim 53 wherein the AA2xxx include alloys selected from the group consisting of AA2024, AA2014, AA2026, AA2224, AA2097, AA2297, AA2397, AA2293, AA2219, AA2094, AA2098, AA2095, AA2195.

56. A method of welding age-hardenable aluminum alloy aircraft structural members to improve strength properties in a heat affected zone or a weld zone, the method comprising the steps of:

(a) providing precipitation hardenable AA6xxx aluminum alloy members to be welded;

(b) subjecting said members to one or more temperatures in a temperature range of 320° to 400°F for one or more hours to generate strengthening precipitates;

(c) welding said aged members to provide a welded aircraft assembly;

(d) heating said assembly to one or more temperatures in the range of 320° to 400°F for one or more hours to reprecipitate strengthening precipitates dissolved in the weld zone.

57. The method in accordance with claim 56 wherein said aircraft assembly comprises a wing assembly or wing subassembly, center wing box assembly or subassembly, floor assembly or subassembly including seat tracks and floor beams, stanchions, cargo deck assemblies and subassemblies, floor panels and cargo floor panels, fuselage assembly or subassembly, fuselage frames, fuselage stringers.

58. The method in accordance with claim 56 wherein the AA6xxx include alloys selected from the group consisting of AA6061, AA6013, AA6056 and AA6082.